

September 1965

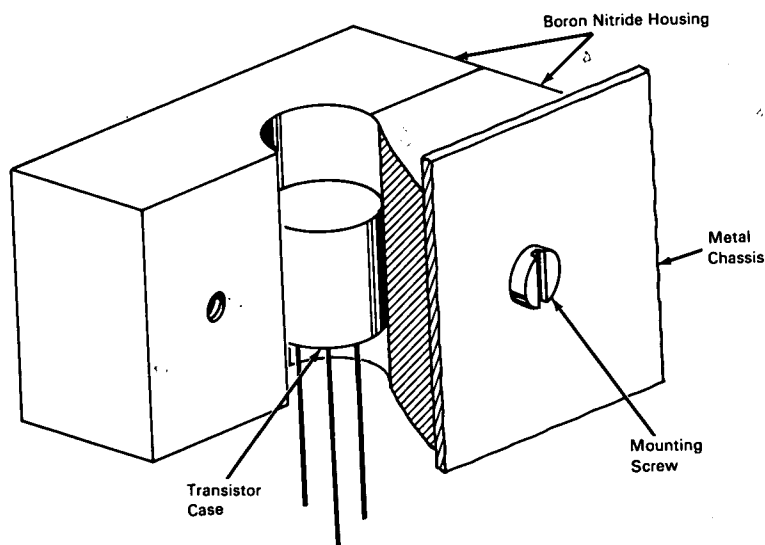
Brief 65-10289

NASA TECH BRIEF



NASA Tech Briefs are issued by the Technology Utilization Division to summarize specific technical innovations derived from the space program. Copies are available to the public from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, 22151.

Boron Nitride Housing Cools Transistors



The problem: To provide a heat sink for conductive cooling of transistors in r-f transmitter and receiver circuits. Since the transistor case is normally a part of the transistor collector circuit, the case must be electrically insulated from a metal heat sink (chassis or equipment wall) in order to minimize stray capacitance effects which would cause the circuit to malfunction. It would therefore be necessary to place the transistor case in contact with a material that is both an electrical insulator and a good thermal conductor.

The solution: Enclose the transistor in a block of boron nitride (BN) ceramic, which is then mounted on a metal chassis. Heat dissipated by the transistor is conducted by the boron nitride housing to the chassis.

How it's done: The boron nitride block is machined or molded into two segments which fit around the transistor case. Two machine screws hold the segments around the case and fasten the assembly to a

chassis. The hole in the boron nitride housing should be machined to allow for tolerances in nominal transistor case diameters to ensure intimate contact of the mating surfaces when the screws are tightened. Optimum heat conductance and holding force are provided by a screw-tightening torque of 25 ounce-inches.

Notes:

1. The rate of heat transfer from the transistor is very high because large areas of the thermally conductive, lightweight boron nitride ceramic are in intimate contact with the transistor case and metal chassis.
2. Because of its all-dielectric construction, the electrical insulating properties of this device cannot be affected by scratching or chipping which will damage insulation coatings commonly used on metal heat sinks.

(continued overleaf)

3. The boron nitride housing can be easily disassembled for replacement of faulty transistors.
4. The basic design of the boron nitride housing can be easily modified to accommodate more than one transistor or other electronic components.
5. Boron nitride does not present the fabrication difficulties and toxic hazard of beryllium oxide which also has been used for heat sinking because of its excellent combination of electrical and thermal properties.
6. Related innovations are described in NASA Tech Briefs B63-10033, April 1964; and B65-10186, June 1965.

7. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Western Operations Office
150 Pico Boulevard
Santa Monica, California, 90406
Reference: B65-10289

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated by NASA.

Source: Space Technology Laboratories
under contract to
Western Operations Office
(W00-079)